A Study of the Physical Capacity and Capital Investment in Nova Scotia's Fish Processing Industry

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Fisheries and Oceans
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by

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FOREWORD

This report by CO-FISH Consultants describes their findings from a contract awarded them in 1986 (Project 09SC.FP111-5-0644) to verify data obtained periodically by the Department of Fisheries and Oceans on the capacity of individual fish processing establishments in Nova Scotia and to convert these estimates of physical capacity into estimates of capital investment in its various components of the industry. The contract was funded under the Canada-Nova Scotia Fisheries Subsidiary Agreement (Economic and Regional Development Agreement) which is directed to the creation of net social and economic benefits to the province through strenghtening the fisheries contribution to the provincial economy. The question of capacity, capacity utilization and capital investment in the industry were pre-requisites to the evaluation of the effects of the Subsidiary Agreement.

The Department has been concerned over time with the performance of this industry. The negative economic development in the Atlantic fish processing industry from 1979 to 1982 which was noted in the 1982 Report of the Task Force in Atlantic Fisheries resulted in part from external factors (markets, rates of exchange, rising costs, etc), but also some costs resulted from "excess capacity" resulting in non-optimal levels of operation of individual plants, in excessive input costs or in distorted location patterns. Further, the industry has a record of slow innovation, with "long-lived" plants where obsolescence or modernization may not be reflected in visible external changes and where changes in capital investment may not imply changes in capacity.

This report is therefore a part of translating the measurements and concepts of physical capacity into an economic context. Another part of this question is treated in Canadian Technical Report of Fisheries and Aquatic Sciences No. 1588.

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ABSTRACT

Co-Fish Consultants Ltd. 1987. A Study of the Physical Capacity and Capital Investment in Nova Scotia's Fish Processing Industry. Can. Tech. Rep. Fish. Aquat. Sci. 1589:25p

In 1986, about 300 fish processing establishments in Nova Scotia represented an estimated capital investment of $149 million. The daily processing capacity of these establishments is estimated, in millions of pounds landed weight at 6.4 filleting, 3.9 splitting, 5.3 freezing and 7.9 de-roing. In addition, the capacity for pickling/kenching is 25.3 million pounds, cool temperature storage 73.5 million pounds, cold storage 83.8 million pounds and lobster holding 3.4 million pounds.

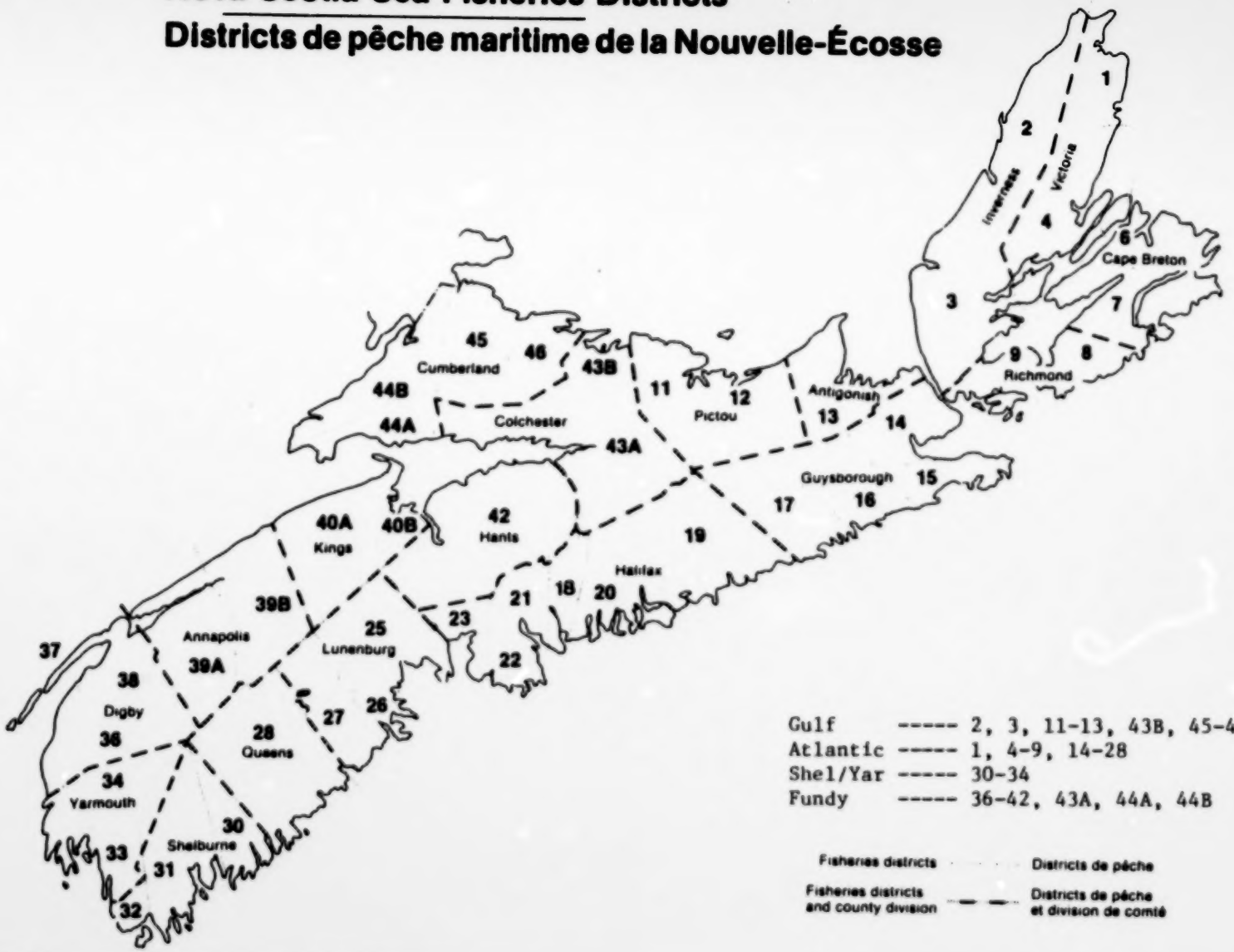
RESUME

Co-Fish Consultants Ltd. 1987. A Study of the Physical Capacity and Capital Investment in Nova Scotia's Fish Processing Industry. Can. Tech. Rep. Fish. Aquat. Sci. 1589:25p

En 1986, à peu près 300 établissements de transformation de poisson en Nouvelle-Ecosse représentaient un capital investi d'environ $149 million. La capacité quotidienne de ces établissements en millions de livres, poids au débarquement, se chiffrait à près de 6.4 poisson en filet, 3.9 poisson tranché, 5.3 poisson congelé, et de 7.9 extraction de rave. En plus, la capacité pour le salage/salage à sec était est 25.3 millions de livres, l'entreposage au frais 73.5 millions de livres, l'entreposage au froid 83.8 millions de livres et des viviers à homard 3.4 millions de livres.

Nova Scotia Sea Fisheries Districts

Districts de pêche maritime de la Nouvelle-Écosse



Introduction

The physical appraisal phase of the "Capacity and Investment in Nova Scotia's Processing Industry" was completed at mid-July. The individual appraisals of the more than three hundred facilities were written up thereafter and submitted to the Scientific Authority on August 5th. The results of the appraisals were then summarized, analysed and submitted on September 3, 1986. The task was greater than we had anticipated but was very interesting work.

We received excellent cooperation from everyone of the processors that we interviewed, with one exception only. They provided us with all of the details that we requested and, in most cases, took time from their busy schedules to accompany us on an appraisal tour of their facilities. We also received excellent cooperation from Cleo Cormier, the Scientific Authority for the study, and from his Assistant, Art Willett. To both of them we are most indebted.

Capacity, as it applies to fish plants, is their ability to receive and to process, whether partially or totally, the raw material made available to them by the harvesting sector. Because processing is not necessarily one operation, but most often a series of operations, and the capacity of each operation can vary, the operation with the least capacity, or the "bottle neck", determines the capacity of the individual plant. To consider that capacity only, however, would not be entirely realistic because it could sometimes be increased substantially with relatively minor adjustments or additions. In other cases, some plants have a substantial capacity, but they can only semi-process and have to depend upon other plants to complete the preparation of the product or products.

As a result, we have not restricted ourselves to one overall capacity. Instead, we have categorized the establishments/operations according to the functions performed, the species with which they are involved, and then their capacities to receive and process. That is the sequence that we shall follow in our analysis and related comments.

Functions

For the sake of analysis, we categorized the activities of the establishments/operations into seven functions. Some perform two or more functions, and we have included them under each of the applicable categories. Thus the total of the functions is greater than the number of individual establishments/operations surveyed (Table 1).

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The number of processors classified to these seven functions are:

1.	Fish Markets	13
2.	Buying Stations	48
3.	Primary Processors	192
4.	Secondary Processors	115
5.	Aquaculture Operations	4
6.	Feeder Plants	76
7.	Central Processors/Packers	13

We shall consider briefly each of the above categories.

1. **Fish Markets**

There are more than 13 fish markets in Nova Scotia. We only surveyed those which were registered as processors. A number of fish markets operate on a seasonal basis only, are part of a processing operation or work very closely with one, and they handle only processed products.

But even those which are registered as processors cannot easily be rated for processing capacity. They do not process according to any capacity or pre-determined schedule, but rather they process to meet the requirements of their clientele. Their processing can best be termed as "a little bit of everything", from the cooking of shellfish and the shucking of shellfish meat to dressing, filleting, slicing, salting, marinating, and even salting.

2. **Buying Stations**

These do not do any processing, but they provide a very essential service to fishing communities where there are no processing facilities, and they are also an essential source of raw material for processing operations. Some are owned and operated by the processors themselves; others are owned and/or operated by independent buyers who purchase the fish from the fishermen and then sell it to one or various processors.

The buying stations vary from a minimal facility---a hoisting/loading device at the end of the wharf---to rather elaborate facilities which can include vacuum unloaders, ice making and ice storage, bait storages, trawl baiting rooms, and coolers to hold the fish while it is being purchased/assembled prior to shipment to its ultimate destination. In some cases, the fish is even shipped in the fresh/unprocessed state directly from the buying stations to market.

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Most of the buying stations are located in Eastern Nova Scotia (including Cape Breton Island) where the processing facilities are fewer and, in most cases, at considerable distance from each other. They provide services to areas where there is not sufficient volume of landings to support a separate processing facility. The situation in Western Nova Scotia is different. Usually, there is a processing facility in every community and, in some communities, there are many, thus making buying stations unnecessary.

3. **Primary Processors**

The primary processors are those who receive the fish and who do the initial processing, whether it be to fillet, to split, to pickle, to de-roe, to cook and shuck as in the case of shellfish. It is their capacity which must be able to absorb the landings that result from the harvesting effort. We have separated "secondary processors" therefrom because they draw their raw material from the primary processors---a semi-processed raw material ---rather than directly from the harvesters. To combine the primary capacity and secondary capacity when relating same to the available resource would be duplication.

Many establishments/operations, however, are involved in both primary and secondary processing. In the salt fish industry, most of those who do the primary processing of splitting and pickling also do the secondary processing of de-boning and/or drying.

4. **Secondary Processors**

As we have already mentioned under "Primary Processors", secondary processing is the further processing of the production resulting from the initial or primary processing. That includes such operations as de-boning, drying, smoking, breading and battering, the reduction of offal into meal and certain types of canning.

The majority of secondary processors are "fish dryers". Over and above those who dry the fish which they themselves have split and pickled, there are many operations in Western Nova Scotia which specialize in the cutting, de-boning and/or drying of fish on behalf of major processors of pickled fish. They usually consist of a small operation, a "man and wife" or family. Usually, they do not own the fish that they process. The pickled fish is supplied to them, they cut/skin/de-bone and/or dry it for a fee, and it is then returned to the owners for drying and/or packaging prior to marketing. Because of the piecework incentive, it would seem that said phase of processing can be done more effectively by these cutting plants.

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5. Aquaculture Operations

Although we only surveyed four operators who were involved in aquaculture, the four who were registered with DFO, we presume that there are others who are involved with aquaculture per se and are not yet involved in any processing, or who do not require to be registered. Of the four surveyed, two were involved with mussels and two were involved with salmon and trout.

6. Feeder Plants

We categorize as "feeder plants" those establishments/operations which only do semi-processing, and which then turn over their production to central processors/packers for further processing, packaging and marketing. In many cases, these feeder plants never own the raw material which they semi-process. Rather, they provide a processing service on a piecework basis. They provide the facility and the labour for a fee. These include the operations that do the cutting/skinning/de-boning of salt fish, those that do drying only, those that cut/skin fresh fillets only, some that split and pickle groundfish only, some that de-roe herring only. We identified seventy-six such feeder plants, and almost all of them are located in Western Nova Scotia.

7. Central Processors/Packers

These are the operators who receive the production from the feeder plants to supplement their own production or processing effort. We identified 13 that were so involved. Some of the major operators have even discontinued certain processing operations, such as filleting, and have increased their capacity to trim/candle/grade/package/freeze the increased volume of fresh, skinless fillets which they can obtain from feeder plants. Some of those major operators are active buyers of fish throughout the Region to supply an ever-increasing number of such feeder plants.

Although these central processors/packers are amongst the critics of the proliferation of processing plants, one many justifiably ask to what extent they themselves are responsible for encouraging the establishment of feeder plants. They become sources of additional production for them without much additional investment on their part, and it also appears that they can purchase their semi-processed production cheaper than they themselves could do that part of the process.

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Species

For the purpose of this section, we have only listed the six major species, having grouped all groundfish as one, and also having added "others" as somewhat of a catch-all. Some processors specialize in one species. Others are involved in many. From the information that was provided to us, we have arrived at the following number of processors involved with these species/species groups:

1.	Groundfish	199
2.	Scallops	23
3.	Lobsters	101
4.	Crabs	8
5.	Herring	76
6.	Mackerel	36
7.	Others	20

1. Groundfish

It is in groundfish that the greatest number of buyers/processors are involved. Of the 199 involved therein, 137 were involved in splitting/pickling/de-boning/drying, 30 were involved in frozen products, and at least 85 were involved in the handling of fresh products, whether as feeder plants for major processors or for shipment directly to the market.

Although there are groundfish processors throughout the area, the greatest number is located in Western Nova Scotia, and especially in the Shelburne County area where more than one-third of the Nova Scotia processors are located. Furthermore, most of the groundfish processors in Shelburne County area are involved in the salt fish sector (splitting/pickling/de-boning/drying), while the majority of those in the Digby County area (French Shore/Digby Neck) are involved in fresh fillets, and mostly as feeder plants.

2. Scallops

We were able to identify 23 operators who were involved in scallops, either as buyers, as operators of off-shore scallop draggers, or as processors. The major volume, of course, is supplied by the eight off-shore dragger operators. The processors of the production of most of the inshore scallop fleet are located in the Digby area, with a few involved in the rather limited Gulf shore scallop fishery.

Apart from the freezing requirement, the volume and the cost of equipment for washing/grading/packaging is not substantial. From our observations, some 10 to 12 employees can process up to 35,000 lbs. of scallops within an 8 hour work period.

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3. **Lobsters**

One hundred and one operators were involved in the buying and/or holding of lobsters throughout the area. Only three plants were actively involved in the processing of lobsters, and these were located along the Gulf coast, the only area where canner size lobsters can be legally caught. A number of lobster distributors did limited processing as a salvage operation.

Of the 101 operators involved with lobsters, most of them simply buy from the fishermen and either sell to processors, to pound keepers, or they ship directly to market. A number of them are involved in the holding or pounding of lobsters, not only to season them prior to shipment, but also to systematically supply the market to obtain maximum price advantage. Of the 42 so involved, 18 operate tankhouses where the lobsters are held in tanks through which sea water is pumped on a continuing basis, 13 have inside pounds or areas within buildings which are filled with sea water and in which the lobsters are usually floated in crates, 11 have tidal pounds in which the lobsters are freed and can be kept for extended periods, and one uses an elaborate system where lobsters are held individually in stacked and compartmentalized trays through which refrigerated sea water continuously flows.

4. **Crabs**

Two species only are exploited, the snow crab off Cape Breton Island, and the Jonah crab off the South Shore. The latter are not being exploited to any degree at the moment. Three processors are involved in the actual processing of the snow crab. Five are involved as buyers for resale to processors out of province. One processor only is equipped to process Jonah crab on a substantial scale, but the equipment is presently idle.

5. **Herring**

Seventy-six operators are involved with herring. Because of the present market situation for most herring products, much of the herring filleting equipment is presently mothballed, although some continue to fillet for freezing, for marinating and for canning. The major effort is in de-roeing for the Japanese market. Fifty-nine operators are so involved, three only in the Gulf fishery, and 56 in the Western Nova Scotia/Bay of Fundy fishery. The remainder either pickle or marinate herring in barrels, smoke kippers, kipperines (fillets), or whole herring for the mild cured trade. Two plants use herring in their canning operations. A number also freeze round herring for the Japanese and East Block markets.

6. **Mackerel**

Thirty-six operators are involved with mackerel which is mostly frozen for longline and lobster bait. Some lesser amounts are sold for food

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in the fresh and frozen state, and some is still being split or filleted and then salted for certain Caribbean and North American markets.

7. **Others**

Amongst the "others", alewives are the most prominent from the point of view of volume. In 1985, there were many additional processors involved in the pickling of alewives. The Haitien market, which had been quite strong during 1984, was glutted. And because the glut situation continued into the 1986 season, the number of processors returned to normal--- some six processors --- except for the alewives fishermen on the Margaree and Gaspareau rivers who process their own catches.

Capacities

In assessing processing capacities, we considered the following:

1. Unloading
2. Holding (in the fresh state)
3. Filleting
4. Splitting
5. Pickling/Kenching
6. Drying
7. Cool or Temperature Controlled Storage
8. Freezing
9. Cold Storage
10. Ice Making
11. Ice Storage
12. De-roeing
13. Lobster Processing
14. Lobster Holding
15. Crab Processing
16. Clam Production
17. Smoking
18. Canning
19. Meal Processing

We shall indicate the capacities that we have assessed as we deal with each operation individually.

1. **Unloading** (17,210,000 lbs. per 8 hour period)

In this analysis, we show unloading capacity on an 8 hour period basis to conform with the capacities of all other processing functions. It is a strikingly high figure. The larger operators, especially those involved

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with the offshore groundfish fishery, do unload on a continuous basis throughout the regular 8 hour work period, and sometimes longer, at rated capacity. Those involved with the inshore production do not necessarily have the same steady incoming supply. The day boats may all arrive at very much the same time towards the end of the day. Capacity to unload quickly is of the essence. What could be unloaded easily and systematically over a regular work shift must be unloaded within hours, thus requiring more capacity which is only utilized over a short period. Thus, what seems to be excessive capacity is needed to accommodate glut situations.

2. **Holding** (15,952,000 lbs.)

We were concerned here with the ability to hold fish in the fresh state, either in transit or in-plant awaiting processing. Most of the capacity shown is in insulated (Xactic or Bonar-Rosedale) boxes, although some still use wooden or fiberglass boxes for part or all of their in-plant requirements.

As for herring, most of the larger operators and even some of the smaller ones are using converted milk tankers to transport and to hold the herring until they are flumed onto the de-roeing tables. Because these were not always on site, we did not take account of them to determine holding capacity, nor did we include them in our estimate of investment value.

3. **Filleting** (6,662,000 lbs. per 8 hour period)

Of the total capacity, 2,685,000 lbs. of herring filleting capacity is provided by machines, leaving a capacity of 4,577,000 lbs. for groundfish filleting provided largely by hand filleting, with some 25% of the capacity being provided by machines. Although as many as 100 processors are involved in filleting, only 30 have freezing facilities for fillets and can complete the process. The remainder either ship the skinless fillets to market in the fresh state, or they turn them over to the central processors/packers for further processing.

4. **Splitting** (3,864,000 lbs. per 8 hour period)

On average, we used 35,000 lbs. of capacity per Baader 440 Splitting Machine, and 6,000 lbs. per hand splitter, unless the operators could justify differently. It can be argued, and rightly so, that the Baader 440 can split up to 50,000 lbs. of large pollock and cod during an 8 hour work period, and that a good hand splitter can split well over 10,000 lbs. of such fish during the same period. We did use higher capacities where we knew that the smaller fish was being filleted, and only the larger fish was being split.

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A number of processors who do convert a substantial percentage of their pickled fish into boneless have discontinued using the Baader 440 splitting machine. Although it is more economical than manual splitting (the labor component being less and the yield being greater), it leaves more bones and does not provide as attractive a fillet. What is gained in productivity and in yield initially is subsequently lost in labor cost during the secondary processing, and also in quality.

5. **Pickling/Kenching** (25,267,000 lbs.)

Of the total capacity, 6,502,000 lbs. or 25% is kenched rather than pickled. The kenching is done by a few major processors who have chosen to build cooler capacity rather than purchase pickling tank capacity. Others kench when they run out of pickling capacity. Those who debone a substantial portion of their production maintain that pickled fish is preferable from the point of view of ease of processing and product quality. Certain markets for salt bulk fish do indicate a preference for kenched fish.

Most of those who kench do so on pallets, using a "skirt" made of plywood to facilitate stacking and to hold the salt against the outside edges to assure that sufficient salt will adhere and be absorbed during the initial critical period. The skirts may be removed after three to four days for reuse.

Most of the fish that is pickled is now pickled in fiberglass tanks. Some still have and use cement tanks, but many of said cement tanks are only used to provide capacity for production which may be surplus to their fiberglass tanks.

6. **Drying** (831,000 lbs. of load capacity or per day)

The above capacity is the loaded dryer capacity, plus outdoor flakes. We have averaged out the drying at "one day" because most fish is not now dried below the "ordinary cured" level, and that can be achieved in one day, if the fish has been well press-piled beforehand to remove maximum of excess moisture. Most markets now have adequate warehousing facilities to hold dried fish. At controlled temperatures, the fish does not have to be dried to the low moisture contents of yester'years. It is not as expensive to dry, and the fish has a smoother appearance than the highly dehydrated product.

Some markets still insist on lower moisture contents. Because boneless fillets can be dried in 6 to 8 hours, and as much as two dryer loads can be dried within a 12 to 16 hour period, the average of one dryer load per day overall is not an exageration.

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Many processors have converted to new Southwind dryer units which incorporate the heat pump/dehumidification system. They can effectively dry irrespective of weather conditions which, using conventional furnace dryers, made drying difficult when there were excesses of temperature and humidity.

Outdoor flakes have regained a fair degree of popularity. They are used extensively, often exclusively by many to dry boneless fillets during the spring/summer/fall when weather conditions permit. They can be dried in 4 to 6 hours when humidity and wind conditions are ideal, they dry without showing as much residual salt as they do when dried in dryers and, for reasons not easily explained, they retain more weight at the same degree of dryness as those fish dried inside.

7. **Cooler or Temperature Controlled Storage** (73,464,000 lbs.)

Gradually, processors have increased their temperature controlled capacity to hold temporarily or to warehouse over extended periods their incoming raw material, as well as their wet salted fish, their pickled/marinated products and their dried products. Although the total capacity is considerable, and some do have adequate capacity, some still do not have any, or not sufficient for their requirements.

A few have achieved considerable diversity to maximize usage. They have installed sufficient refrigeration capacity and the effective controls to be able to vary the temperature in their facilities from a high of 34°F to a low of -20°F so that they may use them either as coolers or as cold storages, as the need dictates.

8. **Freezing** (5,268,500 lbs. per day)

Much of the above capacity is provided by plate freezers, with lesser amounts by blast freezers, and a few tunnel freezers. A few are using CO_2 systems for certain products where quick-freezing is critical, such as crab legs, or where peaks of production cannot be accommodated by existing capacities.

When asked if they had freezing capacity, a considerable number of processors answered affirmatively, but when asked to explain the type and capacity, they admitted that they were freezing product, mostly herring and mackerel for bait, in their small cold storages. It is not a recommended procedure for freezing product other than bait, and it is not recommended for bait either when any product other than bait is stored therein.

It is interesting to note that, of the 65 processors who do have freezing capacity, 12 of them have more than 65% of same.

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We arrived at a daily capacity because most of the blast freezers require more than 8 hours to freeze their rated load capacity. Using 3 hours of freezing time to freeze maximum load capacity for Plate Freezers, we multiplied sai load capacity by six which would thus require some 20 hours, allowing for loading and unloading, and leaving some four hours to defrost the plates. Only during periods of peak production, when freezing round herring, would they be used more than 9 to 12 hours.

9. **Cold Storage** (83,835,000 lbs.)

Of the above, 7,350,000 lbs. can be classified as "bait storage", holding at temperatures varying from 5°F to -10°F.

Of the remaining 76,485,000 lbs., twelve from a total of 121, or roughly 10%, account for 57,700,000 lbs., or 75% of the total.

The above capacity does not include public cold storages not directly connected to the fish processing industry.

The adequacy of the above capacity is debatable. Some do have adequate capacity. Others do not. During periods of peak production and weak demand, cold storages have filled up, and surplus production has had to be shipped to cold storages at the market end. But such situations are not the norm. A few processors who do have substantial freezing capacity have very little storage capacity, and they must ship out regularly. Two do not have any and must load their daily freezing output in refrigerated vans or refrigerated shipping containers, depending upon final destination, for immediate shipment. On the other hand, two substantial cold storages have been empty for a considerable period of time. They are far removed from where the need for additional cold storage exists. Such are the fluctuations in production and the utilization of capacities from one area to the next.

10. **Ice Making** (2,544 tons per day)

Over recent years, there has been a substantial increase in capacity throughout the Region. The above capacity does not include certain ice plants which are owned separately and apart from the fishing industry. Some processors have voiced their complaints that, at certain times, especially when it is most needed during the summer months, ice is not available to them, nor to the fishermen who produce for them, because their usual suppliers do not have any that is surplus to their own needs. That situation is somewhat the exception. A few more ice makers located in the areas of shortage could overcome the situations that arise from time to time.

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11. **Ice Storage** (5,854 tons)

The "rule of thumb" is to have storage for three times the daily manufacturing capacity. This rule has been followed rather faithfully, but for the adidtion of ice makers to already existing structures without increasing the storage capacity. The present ratio of ice storage to ice making is 2.3 to 1. Some increase in ice storage capacity could ease the shortage that exists in certain areas at certain times, but it would not necessarily resolve the entire problem.

12. **De-roeing** (7,924,000 lbs. per 8 hour period)

Of the 59 operators involved, 45 of them are from the Yarmouth/ Digby area. And most of them are involved as feeder plants, that is, they do not freeze the roe, nor do they market same directly and, in most cases, they do not buy the herring, but the herring is supplied to them by the central processors/packers who ultimately receive, freeze and market the product.

It is a labor intensive operation. The "rule of thumb" is that an employee should de-roe one ton of herring during an 8 hour period. If all plants were working at rated capacity, they would be employing some 4,000 people. Many have indicated that they are not able to hire the number of employees that they want and could use, yet additional plants are scheduled to come on stream for the 1986 de-roeing season.

Part of the reason why so many have become involved in de-roeing is that it requires limited investment. Plants that process groundfish fillets can convert to the de-roeing of herring with a minimum of alterations and cost. Some, however, have built new facilities for the de-roeing of herring, which is of relatively short duration, and, now that they have a facility which is idle for most of the year, they are planning to reverse the process and also become involved in the processing of groundfish, thus adding to an already surplus capacity situation.

Furthermore, the central processors/packers are also encouraging more feeder plants to become involved because it increases their own throughput with the minimum of investment on their part.

Up until the present time, the Japaanese buyers have tolerated the transfer of roe, sometimes under less than ideal conditions, from one plant to the other for freezing because of the demand for same. As European production of roe increases and the supply catches up to or exceeds the demand, they may not be as tolerant, and those without freezing capacity could find themselves being pushed out of the de-roeing business.

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13. **Lobster Processing** (67,000 lbs. per 8 hour period)

Canner size lobsters are only legally caught along the Gulf coast and the Cape Breton side of the Cabot Strait. Thus, the reason why whatever lobster processing there is should be concentrated in that area. For a time, there was no lobster processing because it was not economical to have such processing operations over such a short season. With the addition of crab processing, it has made possible an extended processing season, and three plants were involved in lobster processing during 1985, doing some shucking and some freezing in the shell (popsicles). Fish markets and live lobster holders/distributors also do a limited amount of shucking as a salvage operation for weak and damaged lobsters.

14. **Lobster Holding** (3,454,000 lbs.)

Most of the lobsters landed in Nova Scotia are of the size (3 3/16 carapace measurement) to be marketed live. The catches are usually at peak level at the beginning of the seasons (late November/early December and early May) when the market demand is not strongest. To reduce their vulnerability to excessive supply pressures, the industry has structured a holding capacity which permits it to hold back surplusses and to supply the market in a more systematic, disciplined manner.

Tidal pounds have been in use for a long time. There are 11 such pounds in operation with a combined capacity of 1,215,000 lbs. Tankhouses, where lobsters are held in tanks through which sea water is pumped continuously, have also been in use for a long time. There are 18 such facilities with a combined capacity of 544,000 lbs. More recently, "inside pounds" have become rather commonplace. They consist of a large cement tank, often the cement foundation of a building, which is filled with sea water, same being pumped through continuously and aerated, and the crated lobsters are floated therein. They have proven quite effective for both holding and handling. There are 13 such inside pounds with a combined capacity of 695,000 lbs.

More recently, one plant has evolved a sophisticated holding system using stacked and compartmentalized trays in which the lobsters are held individually. Its capacity allegedly exceeds 1,000,000 lbs., and the same owners are proceeding with plans to build a second plant using the same technology, and with even a greater capacity.

Over and above the afore-mentioned holding facilities, hundreds of thousands of pounds of lobster can be held in crates or in lobster cars for relatively long periods, especially during December when the water is cold and the lobsters are at their best.

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15. **Crab Processing** (95,000 lbs. per 8 hour period)

Three plants on the Gulf side have been processing snow crab, mostly sections. One did not operate in crab during 1986, and another did only a limited quantity. One plant on the South Shore has all the equipment necessary to do crab (intended for Jonah crab), but it too did not operate during 1986.

16. **Clams** (In-Shell, 825 bushels/day; Shucked, 565 bushels/day)

The clam industry is mostly concentrated in the Sonora area, the Yarmouth/Digby area, and in the Five Island/Advocate area. The above capacities are those which are registered. A substantial volume of clams are shucked in the homes and can be sold within the province. We only surveyed the registered plants. Of the volume of clams dug, a portion is sold in the shell for "steamers". The remaining portion is shucked for "fryers".

The 825 bushels per day represent the production of these diggers who sell to registered plans, and that is based on digging one tide only per day which is the norm. Depending upon the tide schedule, they can dig during two tides at certain times, thus increasing the above indicated capacity considerably.

The 565 gallons per 8 hour period represent the capacity of the registered plants to shuck. A few packers buy shucked clams from home shuckers, wash and pack them for in-province sale. That does not require elaborate facilities, and the quantity that can be done is substantial. One small processor claimed that he could do up to 600 gallons per 8 hour period with three employees.

17. **Smoking** (load capacity of 338,800 lbs.)

We should clarify that most of that capacity is provided by two bloater/smoked herring fillet plants, and one of them has not been operation for a few years, although it could be re-activated with a minimum of cost and effort. The remaining 14 smokers account for a small capacity which may or may not be a daily capacity because the time required to smoke varies from species and products, and whether they are hot or cold smoked. Two operators have sophisicated mechanical smokers; the remainder use home-made smokers.

18. **Meal** (2,524 tons per day)

Of the 14 reduction plants, eleven constitute parts of major processing operations, and the other three are operated as separate entities, drawing their raw material from the processing plants that operate in the surrounding areas.

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Their capacity was reasonably adequate prior to the herring de-roeing effort, the herring carcasses therefrom now resulting in a rather serious disposal problem. Of the four meal plants in the area where the major portion of the herring is de-roed, only two are adequately equipped with the oil separators to remove the high oil content that there is in the herring at that time of year. The other two plants were built to accommodate groundfish offals which are low in fat and can therefore be processed into meal without oil extraction. They cannot effectively process herring.

A quick assessment of herring de-roeing capacity and meal processing capacity is sufficient to underline the disposal problem. The de-roeing plants, operating at rated capacity, can de-roe up to 4,000 tons of herring during an 8 hour period. The roe only accounts for some 6 to 8 percent by weight of the herring so processed. Some of the de-roed herring is further processed into fillets or headless and dressed, but that represents only a small percentage, possibly not more than 10 to 15 percent. That leaves a minimum of some 3,000 tons of herring offals, and only some 800 tons of reduction capacity to handle it. A quantity is barged across the Bay of Fundy to a meal plant on the New Brunswick side, but most of the surplus must be buried, and the long term impact on the environment cannot yet be determined with any degree of accuracy.

19. **Canning**

The case to which we refer contains 100 tins of some six ounces net content. Only two plants have a canning capacity. One specializes in sardines; the other in herring fillets, either smoked or in various sauces. Accordingly, their estimated capacity is not reported.

Investment

The present "investment value" of all facilities was the most difficult to assess accurately. Since original cost, replacement cost, depreciated value or market value do not necessarily represent the realistic investment value at this moment in time, we based our evaluation on the approximate replacement cost, the total life expectancy of the facility, less the years that it had already been in service. If its life expectancy were 40 years (depending upon type of construction), and it had already been in service for 20 yars, we valued it at one-half its present replacement cost (example). Total investment was thus evaluated at $148,832,500.

Of the 302 facilities that were assessed for value, 17 accounted for $82,500,000 of the total evaluation of $148,832,500, or 55%. 126 were valued at less than $100,000 each, and those were mostly boneless cutting, drying, and de-roeing plants, buying stations and fish markets.

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Equipment was often more of a contributor to value than the plant construction itself.

We did not attempt to place a value on vessels which were owned by processing operations, nor did we attempt to place a value on vehicles --- forklifts and trucks, including the tanker units used in the transportation and storage of herring. It was beyond our competence to assess their condition and value, and there was also the matter of ownership; some were rentals, some were under lease/purchase agreements, and some were owned outright by the operators.

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TABLE 1

Number of Fish Processing Establishments in Nova Scotia, 1986, by Function and by Principal Function, by Area

Function	Number of Establishments by Area and Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Fish Market	3	6	1	3	13
Buying Station	10	18	17	3	48
Primary Processor	8	38	91	55	192
Secondary Processor	1	21	73	20	115
Aquaculture	-	3	1	-	4
Feeder Plant	-	-	58	18	76
Central Processor/ Packer	-	-	13	-	13
Principle Function					
Fish Market	3	6	1	2	12
Buying Station	6	15	13	3	37
Primary Processor	7	33	78	53	171
Secondary Proceesor	-	-	46	3	49
Aquaculture	-	3	1	-	4
Total Establishments	16	57	139	61	273

TABLE 2

Number of Fish Processing Establishments in Nova Scotia, 1986, by Species Processed, by Area

Species	Number of Establishments by Area and Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Groundfish	12	40	104	43	199
Scallop	2	7	2	12	23
Lobster	16	24	51	10	101
Crab	5	3	-	-	8
Herring	3	13	38	22	76
Mackerel	3	30	3	-	36
Other	2	13	5	-	20

TABLE 3

Number of Fish Processing Establishments in Nova Scotia, 1986, by Activity, by Area

Activity	Number of Establishments by Area and Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Unloading	11	38	66	23	138
Holding	7	36	76	41	160
Filleting	4	22	32	38	96
Splitting	4	26	58	13	101
Pickling/Kenching	4	26	63	17	110
Drying	2	16	58	12	88
Cool Storage	4	25	74	40	143
Freezing	4	25	22	14	65
Cold Storage	12	31	59	16	118
Ice Making	12	29	35	27	103
Ice Storage	12	29	35	27	103
De-roeing	2	2	29	26	59
Lobster Processing	3	3	1	-	7
Lobster Holding	3	4	23	6	36
Crab Processing	3	1	-	-	4
Clam Processing	-	1	1	12	14
Smoking	-	6	1	9	16
Canning	-	-	1	1	2
Meal	1	8	3	2	14

TABLE 4

Groundfish Processing Capacity and Number of Establishments in Nova Scotia, 1986, by Type of Processing, by Area

Type of Processing	Capacity (C) & No. of Establishments (N) by Area & Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Filleting (C)(1)	112	1,563	1,059	1,843	4,577
Splitting (C)(1)	155	1,231	2,138	340	3,864
Pickling (C)(2)	1,000	4,075.5	11,961	1,189	18,225.5
Kenching (C)(2)	-	4,302	2,200	-	6,502
Drying (C)(2)	-	210 (3)	542.5	79	831.5
Freezing (C)(2)	1,083	1,787	957	875.5	4,702.5
All Processing (N)	12	40	104	43	199

(1) '000 lb. per 8 hour
(2) '000 lb. per day
(3) Includes capacity for Gulf which has only 2 drying plants.

TABLE 5

Scallop Processing Capacity in Nova Scotia, 1986, by Area

Capacity by Area and Total				
Gulf	Atlantic	Shel/Yar	Fundy	Total
-	106 (1)	-	270 (2)	376

(1) Includes capacity for Gulf which has only 2 scallop processors
(2) Includes capacity for Shelburne/Yarmouth which has only 2 scallop processors

TABLE 6

Lobster Processing Capacity and Number of Establishments in Nova Scotia, 1986, by Type of Processing, by Area

Type of Processing	Capacity (C) & No. of Establishments (N) by Area & Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Fish Market (C)(1)	-	42	-	2.5	44.5
Buying Station (C)(1)	150	20	1,365	220	1,755
Cooking/Freezing (C)(1)	107	130	-	-	3,454 (3)
(C)(2)	50	12	-	-	67 (3)
All Processing (N)	16	24	51	10	101

(1) '000 lb storage
(2) '000 lb cooking/freezing per 8 hour
(3) Includes capacity for Shelburn/Yarmouth and Fundy which have less than 3 lobster processors.

TABLE 7

Herring Processing Capacity and Number of Establishments in Nova Scotia, 1986, by Type of Processing, by Area

Type of Processing	Capacity (C) & No. of Establishments (N) by Area & Total				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Filleting (C)(1)	-	80	2,190	415	2,685
Pickling (C)(2)	-	-	390 (3)	-	390
De-roeing (C)(1)	250	450	3,990	3,234	7,924
Freezing (C)(2)	-	-	1,016 (4)	-	1,016
Smoking (C)(2)	-	12.8	-	326	338.8
All Processing (N)	4	12	38	22	76

(1) '000 lb per 8 hour
(2) '000 lb per day
(3) Includes capacity for Fundy which has only one herring pickling processor
(4) Includes capacity for Gulf, Atlantic and Fundy which have 3 or fewer herring freezing plants

TABLE 8

Common Services Capacity in Nova Scotia Fisheries, 1986, by Type of Service, by Area

Type of Service		Capacity by Area and Total				
		Gulf	Atlantic	Shel/Yar	Fundy	Total
Unloading	(1)	1,190	5,750	7,520	2,750	17,210
Holding	(2)	920	4,072	7,255	3,705	15,952
Cool Storage	(2)	1,415	16,117	46,245	9,687	73,464
Cold Storage	(2)	2,680	13,975	27,245	9,935	83,835
Ice Making	(3)	109	978	931	526	2,544
Ice Storage	(4)	320	2,102	2,259	1,177	5,854

(1) '000 lb per 8 hour
(2) '000 lb
(3) Tons per day
(4) Tons

TABLE 9

Capital Investment in Fish Processing in Nova Scotia, 1986, by Type of Processing, by Area

Type of Processing	Investment by Area and Total (1)				
	Gulf	Atlantic	Shel/Yar	Fundy	Total
Fish Markets	110	454	-	262 (2)	826
Buying Stations	305	1,322	865	50	2,542
Groundfish	1,480	52,436	36,650.5	10,616	101,182.5
Herring	625	966	16,132	7,880	25,603
Scallop	-	4,172 (3)	-	4,032(2)	8,204
Lobster	945	544	6,490	220	8,199
Other	-	-	2,276	-	2,276
Total Investment	3,465	59,895	62,413.5	23,060	148,832.5

(1) $'000
(2) Includes Shelburne/Yarmouth
(3) Includes Gulf